ABSTRACT OF THE DISCLOSURE

Compositions, systems and methods are described for condensed phase conversion and growth of nanorods and other materials. A composition includes a plurality of nanorods that define a local volume, said local volume including a fraction, said plurality of nanorods within at least said fraction of said local volume interrelated to define (a) a substantially random distribution of intersection angles between said plurality of nanorods and (b) a localized packing density greater than 50% of a theoretical maximum packing density, which does not account for any voids within said plurality of nanorods . A method includes providing a condensed phase matrix material; and activating the condensed phase matrix material to produce a plurality of nanorods by condensed phase conversion growth. The compositions are very strong. The systems and methods provide advantages because they allow (1) formation rates of nanostructures necessary for reasonable production rates, (2) the near net shaped production of component structures.